

JAPAN

EDICT OF GOVERNMENT

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JIS A 5905 (2003) (English): Fiberboards

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*The citizens of a nation must
honor the laws of the land.*

Fukuzawa Yukichi

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JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

☞ JIS A 5905 : 2003

Fibreboards

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS A 5905 : 1994** is replaced with **JIS A 5905 : 2003**.

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Fibreboards

1 Scope This Japanese Industrial Standard specifies fibreboards which are formed mainly from vegetable fibres of woods or the like.

2 Normative references The standards indicated in Attached Table 1 contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) shall be applied.

3 Classification and symbols

3.1 Classification by density The fibreboards are classified by the density and the manufacturing method as shown in Table 1.

Table 1

Classification	Symbol	Density
Insulation fibreboard (hereafter referred to as "insulation board") ⁽¹⁾	IB	Under 0.35 g/cm ³
Medium density fibreboard (hereafter referred to as "MDF") ⁽²⁾	MDF	0.35 g/cm ³ or over
Hard fibreboard (hereafter referred to as "hard board")	HB	0.80 g/cm ³ or over

Notes ⁽¹⁾ Among the insulation boards, the sheathing board which is treated with asphalt or the like in the manufacturing process or after manufacturing shall be under 0.40 g/cm³ in density.

⁽²⁾ MDF is prepared by drying process.

3.2 Insulation boards The insulation boards shall be classified according to the use and incombustibility.

a) **Classification according to the use** The classification according to the use shall be as specified in Table 2.

Table 2 Classification according to the use

Classification	Symbol	Main use (informative)
Straw-mat (TATAMI) board	T-IB	For straw mat (TATAMI) base
Class A insulation board	A-IB	For heat insulation
Sheathing board	S-IB	For sheathing of outside walls

b) **Classification by incombustibility** The classification by incombustibility shall be as specified in Table 3.

Table 3 Classification by incombustibility

Classification	Symbol
Incombustibility grade 3	Incombustibility 3
Ordinary	—

3.3 MDF The MDF shall be classified according to the conditions of face and back surfaces, bending strength, adhesive to be used, formaldehyde emission quantity and incombustibility.

- a) **Classification according to conditions of face and back** Classification according to conditions of face and back shall be as specified in Table 4.

Table 4 Classification according to conditions of face and back

Classification		Symbol	Conditions of face and back
Basis MDF	Polished board	RS	The both surfaces are in basis condition and polished.
Decorative MDF	Veneer overlay	DV	The both surfaces or one surface of basis MDF are adhered with decorative veneer.
	Plastic overlay	DO	The both surfaces or one surface of basis MDF are adhered with synthetic resin sheet, film, synthetic resin impregnated paper, coat paper, after-coat paper and the like, and the decorative surface is plain with monochromatic finishing, or patterned with grain pattern, abstract pattern and the like.
	Coating	DC	The both surfaces or one surface of basis MDF are hardened by thermosetting with synthetic resin paint or printed, and the decorative surface is plain with monochromatic finishing, or patterned with grain pattern, abstract pattern and the like.

- b) **Classification according to bending strength** The classification according to bending strength shall be as specified in Table 5.

Table 5 Classification according to bending strength

Classification	Symbol	Bending strength
Type 30	30	The bending strength shall be 30.0 N/mm ² or over
Type 25	25	The bending strength shall be 25.0 N/mm ² or over
Type 15	15	The bending strength shall be 15.0 N/mm ² or over
Type 5	5	The bending strength shall be 5.0 N/mm ² or over

- c) **Classification according to adhesive** The classification according to adhesive to be used shall be as specified in Table 6.

Table 6 Classification according to adhesive

Classification	Symbol	Adhesive	Main use (informative)
Type U	U	Urea resin system or at least equivalent	Suitable for furniture, cabinets or the like
Type M	M	Urea-melamine copolycondensation resin system or at least equivalent	Suitable for sheathing (floor, inside wall, outside wall, roof), members of fixtures or the like
Type P	P	Phenolic resin system or at least equivalent	

- d) **Classification according to formaldehyde emission quantity** The classification according to formaldehyde emission quantity shall be as specified in Table 7.

Table 7 Classification according to formaldehyde emission quantity

Classification	Symbol	Formaldehyde emission quantity	
		mean	maximum
F☆☆☆☆	F☆☆☆☆	0.3 mg/L or under	0.4 mg/L or under
F☆☆☆	F☆☆☆	0.5 mg/L or under	0.7 mg/L or under
F☆☆	F☆☆	1.5 mg/L or under	2.1 mg/L or under

- e) **Classification according to incombustibility** The classification according to incombustibility shall be as specified in Table 8.

Table 8 Classification according to incombustibility

Classification	Symbol
Incombustibility grade 2	Incombustibility 2
Incombustibility grade 3	Incombustibility 3
Ordinary	—

3.4 Hard board The hard board shall be classified according to special processing by oil, resin and the like, the surface condition, bending strength and incombustibility.

- a) **Classification according to special processing by oil, resin or the like and surface condition** The classification according to special processing by oil, resin, or the like and surface condition shall be as specified in Table 9.

Table 9 Classification according to special processing by oil, resin or the like and surface condition

Classification according to special processing by oil, resin or the like		Classification according to surface condition		
Classification	Symbol	Classification		Symbol
Standard board (unprocessed)	S	Basis hard board	Unpolished board	RN
			Polished board	RS
		Decorative hard board for interior finish		DI
Tempered board (processed)	T	Basis hard board	Unpolished board	RN
			Polished board	RS
		Decorative hard board for exterior finish		DE

Remarks 1 The basis hard boards include one with single smooth surface (S1S), and the other one with both smooth surfaces (S2S).

- 2 The decorative hard board for interior finish is made by bonding synthetic resin sheets, films, cloth/papers or by printing or coating with synthetic resin paint or the like on the surface of the standard board. There are one having flat surface and the other one decorated with uneven patterns by embossing.

The decorative surface includes the plain one finished in single colour and the patterned one with grain pattern or abstract pattern, and is mainly used for the materials for interior finish and the wooden works for furniture.

- 3 The decorative hard board for exterior finish is made by printing or coating the surface of the tempered board with the weather resistant synthetic resin paint and hardened by heating, light irradiation or the like, and includes one whose surface is flat, one decorated with embossed pattern, and the other one with grooves of U-shape or V-shape.

The decorative surface includes the plain one finished in single colour, the one with grain pattern or abstract pattern, and is used mainly as the materials for exterior finish.

- b) **Classification according to bending strength** The classification according to bending strength shall be as specified in Table 10.

Table 10 Classification according to bending strength

Classification		Symbol	Bending strength
Standard board (unprocessed)	Type 35	S35	The bending strength shall be 35.0 N/mm ² or over
	Type 25	S25	The bending strength shall be 25.0 N/mm ² or over
	Type 20	S20	The bending strength shall be 20.0 N/mm ² or over
Tempered board (processed)	Type 45	T45	The bending strength shall be 45.0 N/mm ² or over
	Type 35	T35	The bending strength shall be 35.0 N/mm ² or over

- c) **Classification according to incombustibility** The classification according to incombustibility shall be as specified in Table 11.

Table 11 Classification according to incombustibility

Classification	Symbol
Incombustibility grade 2	Incombustibility 2
Incombustibility grade 3	Incombustibility 3
Ordinary	—

4 Shape, dimensions and tolerance The shape, dimensions and tolerance shall be as follows. However, the dimensions of the product made to order shall be subjected to the agreement between the parties concerned with delivery, and the tolerance of the dimensions and the squareness shall be as specified in Table 13.

- a) **Thickness** The thickness shall be as specified in Table 12.

Table 12 Thickness

Unit: mm

Classification		Thickness
Insulation board (IB)	Straw-mat (TATAMI) board (T-IB)	10, 15, 20
	Class A insulation board (A-IB)	9, 12, 15, 18
	Sheathing board (S-IB)	
MDF	Basis MDF (RS)	2.5, 3, 7, 9, 12, 15, 18, 21, 24, 30
	Decorative MDF (DV, DO, DC)	
Hard board	Basis hard board (RN-HB, RS-HB)	2.5, 3.5, 5, 7
	Decorative hard board for interior finish (DI-HB)	
	Decorative hard board for exterior finish (DE-HB)	5, 7

- b) **Width and length** The width and length shall be as specified in Fig. 1.

Unit : mm

Class A insulation board (A-IB)
Sheathing board (S-IB)
Basis MDF (RS)
Decorative MDF (DV, DO, DC)
Basis hard board (RN-HB, RS-HB)
Decorative hard board for interior
finish (DI-HB)

Straw-mat (TATAMI)
board (T-IB)

Decorative hard board for
exterior finish (DE-HB)

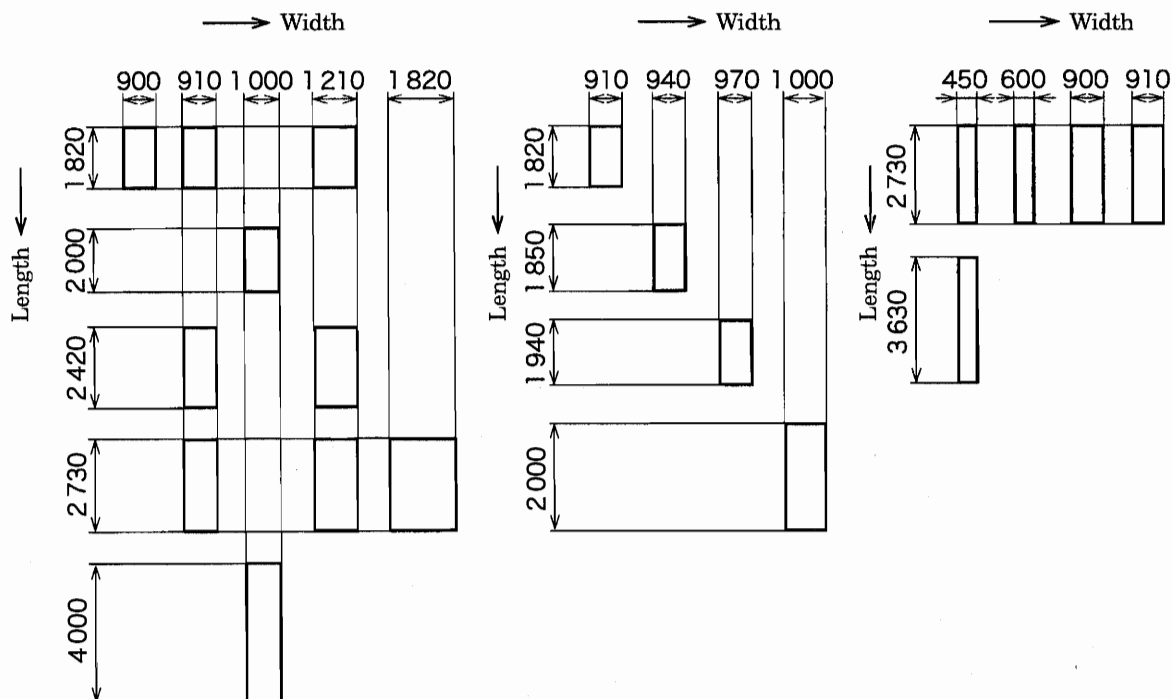


Fig. 1 Width and length

- c) **Tolerance on dimensions and squareness** The tolerance on dimensions and the squareness shall be as specified in Table 13.

Table 13 Tolerance on dimensions and squareness

Classification		Thickness	Tolerance on thickness			Tolerances on width and length	Squareness
			Unpolished	Polished	Decorative		
Insulation board	Straw-mat (TATAMI) board (T-IB)	Under 10	± 1.0	—	—	± 4.0	2 or under
		10 or over	± 1.2				
	Class A insulation board (A-IB) Sheathing board (S-IB)	Under 12	± 1.0				
		12 or over	± 1.2				
MDF		Under 7	± 0.5	± 0.3	± 0.5	± 3.0	
		7 or over to and excl. 15	± 1.0		± 0.5		
		15 or over	± 1.5		± 0.6		
Hard board		3.5 or under	± 0.4	± 0.3	± 10 % of the marked thickness	± 3.0	
		3.6 or over up to and incl. 5.0	± 0.5				
		5.1 or over up to and incl. 7.0	± 0.7				
		7.1 or over	± 0.9				

- Remarks
- 1 The thickness of the decorative board shall be the thickness of the basis material plus the thickness of the decorative layer.
 - 2 The tolerance on thickness of the decorative hard board under 3.5 mm shall be the same as that of the polished product.
 - 3 The tolerance on thickness of the decorative hard board for exterior finish shall be the same as that of the unpolished board.

5 Appearance and quality

5.1 Appearance The appearance shall be as follows:

- a) The surface of the fibreboard shall be free from noticeable unevenness, staining, separation or the like, and moreover, free from twisting, warping or the like which are detrimental to use. The decorative board shall be free from the defects as indicated in Table 14.

Table 14 Appearance of decorative board

Classification of defects	Criterion
Chips ⁽³⁾ , cracks, separation	No such defects shall be found.
Twisting, warping	No such defects which are detrimental to use shall be found.
Unevenness except for decorative purpose, dent, stain, flaw, mixture of foreign matters	No noticeable defects shall be found when viewed at the distance of 60 cm.
Pattern except for decorative purpose, irregular gloss and tone	No noticeable defects shall be found when viewed at the distance of 2 m ⁽³⁾ .

Notes ⁽³⁾ Chips mean those of the basis material and the decorative layer.

⁽⁴⁾ The visual test shall be carried out simultaneously by arranging several decorative boards, side by side.

- b) The sectional surface of the fibreboard shall be excellent, and the side surface shall be orthogonal to the plane of the board. However, the side surface which has been machined for the special purpose need not be orthogonal to the surface.

5.2 Quality The fibreboard shall be tested on the quality items as indicated in Table 15 in accordance with clause 5, and shall comply with the requirements in Table 16 to Table 22.

Table 15 Items of quality

Item of quality		Insulation board			MDF						Hard board				Applicable sub-clause
					Basis			Decorative							
		A IB	T IB	S IB	U	M	P	U	M	P	S HB	T HB	DI HB	DE HB	
Dimension and squareness		○	○	○	○	○	○	○	○	○	○	○	○	○	6.2
Density		○	○	○	○	○	○	○	○	○	○	○	—	—	6.3
Moisture content		○	○	○	○	○	○	○	○	○	○	○	○	○	6.4
Breaking load		—	—	—	—	—	—	—	—	—	—	—	—	○	6.5
Bending strength		○	○	○	○	○	○	○	○	○	○	○	—	—	6.6
Bending strength under wet conditions ⁽⁵⁾	(Test A)	—	—	—	—	○	—	—	○	—	—	—	—	—	6.7
	(Test B)	—	—	—	—	—	○	—	—	○	—	—	—	—	
Water absorption		—	—	—	—	—	—	—	—	—	○	○	—	○	6.8
Swelling in thickness after immersion in water ⁽⁵⁾		○	○	○	—	○	○	—	○	○	—	—	—	—	6.9
Change in length after immersion in water		—	—	○	—	—	—	—	—	—	—	—	—	○	6.10
Internal bond		—	—	—	○	○	○	○	○	○	—	—	—	—	6.11
Wood screw holding power ⁽⁶⁾		—	—	—	○	○	○	○	○	○	—	—	—	—	6.12
Nail pulling-out resistance		—	—	—	—	—	—	—	—	—	—	—	—	○	6.13
Formaldehyde emission quantity		—	—	—	○	○	○	○	○	○	—	—	—	—	6.14
Thermal insulation (thermal resistance value)		○	○	○	—	—	—	—	—	—	—	—	—	—	6.15
In-plane tensile strength		—	—	—	—	—	—	○	○	○	—	—	○	—	6.16
Impact resistance		—	—	—	—	—	—	○	○	○	—	—	○	○	6.17
Acid resistance ⁽⁷⁾		—	—	—	—	—	—	○	○	○	—	—	○	—	6.18
Alkali resistance ⁽⁷⁾		—	—	—	—	—	—	○	○	○	—	—	○	—	6.19
Stain resistance ⁽⁷⁾		—	—	—	—	—	—	○	○	○	—	—	○	—	6.20
Discoloration resistance ⁽⁷⁾		—	—	—	—	—	—	○	○	○	—	—	○	—	6.21
Scratch resistance ⁽⁷⁾		—	—	—	—	—	—	○	○	○	—	—	○	—	6.22
Film adhesion		—	—	—	—	—	—	—	—	—	—	—	—	○	6.23
Washability		—	—	—	—	—	—	—	—	—	—	—	—	○	6.24
Weatherability		—	—	—	—	—	—	—	—	—	—	—	—	○	6.25
Incombustibility ⁽⁸⁾		○	○	○	○	○	○	○	○	○	○	○	○	—	6.26

Notes ⁽⁵⁾ Not applicable to type 5 of MDF.

- (6) Applicable to the boards of thickness 15 mm or over.
 (7) Not applicable to the decorative hard board to which cloths or papers are adhered, veneer overlay, nor after-coat papers.
 (8) Applicable to the fibreboard with incombustibility.

Table 16 Quality of insulation board

Classifica- tion	Thick- ness	Density g/cm ³	Moisture content %	Bending strength N/mm ²	Swelling in thickness after immersion in water %	Change in length after immersion in water %	Thermal resistance m ² • K/W
Straw-mat (TATAMI) board (T-IB)	10	Under 0.27	5 or over up to and incl. 13	1.0 or over	10 or under	—	0.181 or over
	15						0.267 or over
	20						0.361 or over
Class A insulation board A-IB	9	Under 0.35	5 or over up to and incl. 13	2.0 or over	10 or under	—	0.163 or over
	12						0.206 or over
	15						0.267 or over
	18						0.327 or over
Sheathing board S-IB	9	Under 0.40	5 or over up to and incl. 13	3.0 or over	10 or under	0.5 or under	0.138 or over
	12						0.181 or over
	15						0.224 or over
	18						0.275 or over

- Remarks 1 The change in length after immersion in water shall not be applied to the straw-mat (TATAMI) board and the class A insulation board.
 2 The thermal resistance value of the board whose thickness is not indicated in Table 16 shall be at least the value obtained by the proportional calculation.

Table 17 Quality of MDF

Classification		Density g/cm ³	Moisture content %	Bending strength N/mm ²	Bending strength under wet conditions ⁽⁵⁾ N/mm ²	Swelling in thickness after immersion in water ⁽⁵⁾ %	Internal bond N/mm ²	Wood screw holding power ⁽⁶⁾ N	Formaldehyde emission quantity mg/L	Bending Young's modulus (informative) N/mm ²
Type 30	F☆☆☆☆	0.35 or over	5 or over up to and incl. 13	30.0 or over	15.0 or over	17 or under for the thickness of 7 mm or under	0.5 or over	500 or over	mean 0.3 or under maximum 0.4 or under	2 500 or over
	F☆☆☆								mean 0.5 or under maximum 0.7 or under	
	F☆☆								mean 1.5 or under maximum 2.1 or under	
Type 25	F☆☆☆☆			25.0 or over	12.5 or over	12 or under for the thickness of over 7 mm up to and incl. 15 mm	0.4 or over	400 or over	mean 0.3 or under maximum 0.4 or under	2 000 or over
	F☆☆☆								mean 0.5 or under maximum 0.7 or under	
	F☆☆								mean 1.5 or under maximum 2.1 or under	
Type 15	F☆☆☆☆			15.0 or over	7.5 or over	10 or under for the thickness over 15 mm	0.3 or over	300 or over	mean 0.3 or under maximum 0.4 or under	1 300 or over
	F☆☆☆								mean 0.5 or under maximum 0.7 or under	
	F☆☆								mean 1.5 or under maximum 2.1 or under	
Type 5	F☆☆☆☆			5.0 or over	—	—	0.2 or over	200 or over	mean 0.3 or under maximum 0.4 or under	800 or over
	F☆☆☆								mean 0.5 or under maximum 0.7 or under	
	F☆☆								mean 1.5 or under maximum 2.1 or under	

Table 18 Quality of decorative MDF

Moisture content %	In-plane tensile strength N/mm ²	Impact resistance	Acid resistance	Alkali resistance	Stain resistance	Discoloration resistance		Scratch resistance
					Stain resistance for crayon (red)	Appearance	Colour difference	
5 or over up to and incl. 13	0.4 or over	Free from radial cracks, fractures and separations. The diameter of the dent shall be 20 mm or under.	Not to be discolored.	Not to be discolored.	To be grade 3 of gray scale for staining or over.	To be free from defects such as cracks and swelling on the surface.	To be grade 4 of gray scale for discoloration or over, or to be not more than 3.0 of color difference.	To be free from noticeable scratches.

Remarks : The acid resistance, the alkali resistance, the stain resistance, the discoloration resistance and the scratch resistance shall not be applied to the veneer overlay nor after-coat.

Table 19 Quality of basis hard board

Classification			Density g/cm ³	Moisture content %	Bending strength N/mm ²	Water absorption %
Basis hard board	Standard board	S35	0.80 or over	5 or over up to and incl. 13	35.0 or over	25 (35) or under
		S25	0.80 or over	5 or over up to and incl. 13	25.0 or over	25 (35) or under
		S20	0.80 or over	5 or over up to and incl. 13	20.0 or over	30 (35) or under
	Tempered board	T45	0.90 or over	5 or over up to and incl. 13	45.0 or over	20 or under
		T35	0.80 or over	5 or over up to and incl. 13	35.0 or over	20 or under

Remarks: Figures in () are applicable to the standard boards with thickness under 3.5 mm.

Table 20 Quality of decorative hard board for interior finish

Moisture content %	In-plane tensile strength N/mm ²	Impact resistance	Acid resistance	Alkali resistance	Stain resistance	Discoloration resistance		Scratch resistance
					Stain resistance for crayon (red)	Appearance	Colour difference	
5 or over up to and incl. 13	0.4 or over	Free from radial cracks, fractures and separations. The diameter of the dent shall be 15 mm or under.	Not to be discolored.	Not to be discolored.	To be grade 3 of gray scale for staining or over.	To be free from defects such as cracks and swelling on the surface.	To be grade 4 of gray scale for discoloration or over, or to be not more than 3.0 of color difference.	To be free from noticeable scratches.

Remarks : The acid resistance, the alkali resistance, the stain resistance, the discoloration resistance and the scratch resistance shall not be applied to the hard board where cloths and papers are adhered.

Table 21 Quality of decorative hard board for exterior finish

Moisture content %	Water absorption %	Change in length after immersion in water %	Breaking load N	Nail pulling-out resistance N	Impact resistance	Film adhesion	Washability	Weatherability
8 or over up to and incl. 15	10 or under	0.2 or under	400 or over	450 or over	To be free from cracks or separa- tion on the decorative surface.	To be free from separations between films and between the film and the basis material.	To be free from noticeable flaws on the decorative surface.	To be free from cracks, swelling or separations, and the discoloration shall not be noticeably larger than that of the non-exposed one.

Table 22 Incombustibility

Classification	Incombustibility	
	Incombustibility grade 2	Incombustibility grade 3
Incombustible insulation board	—	○
Incombustible basis MDF Incombustible decorative MDF	○	○
Incombustible basis hard board Incombustible decorative hard board	○	○

6 Test methods

6.1 Test pieces

6.1.1 Sampling The test piece shall be sampled for each test item from the centre part of the sample except the peripheral part. The dimensions and number of pieces are specified in Table 23.

In the case of the decorative board with grooves on the decorative surface, the test piece shall be sampled including the groove part. However, this sampling method need not be applied to the film adhesion test.

6.1.2 Conditioning of test piece The test piece which is in the air dried condition⁽⁹⁾ or which reaches the constant weight⁽¹⁰⁾ at a temperature of 20 ± 2 °C and humidity of (65 ± 5) % shall be used. The test piece to be used for the formaldehyde emission test shall be in accordance with 7.3 of **JIS A 1460**. However, the test piece, to which the preparatory processing such as the above-mentioned air dried conditioning has been applied, shall not be used for water absorption test of the decorative hard board for exterior finish.

Notes ⁽⁹⁾ The air dried condition means that the test piece has been left for at least 7 days in a room which is well ventilated.

⁽¹⁰⁾ The constant weight means the value where the mass is measured every 24 h and the rate of change reaches 0.1 % or under.

Table 23 Dimensions and number of test pieces

Test item		Dimensions of test piece mm	Number of test pieces to be sampled from one board
Density test		100 × 100	1
Moisture content test		100 × 100	1
Bending strength test		Width 50 × length [span ⁽¹⁾ + 50]	1 in the longitudinal direction 1 in the transverse direction
Bending strength test under wet conditions		Width 50 × length [span ⁽¹⁾ + 50]	1 in the longitudinal direction 1 in the transverse direction
Breaking load test		300 × 250	1 in the longitudinal direction 1 in the transverse direction
Water absorption test		100 × 100	1
Test of swelling in thickness after immersion in water		50 × 50	1
Test of change in length after immersion in water	Insulation board	70 × 200	1 in the longitudinal direction 1 in the transverse direction
	Decorative hard board for exterior finish	70 × 200	1 in the longitudinal direction —
Internal bond test		50 × 50	1
Test of wood screw holding power		50 × 100	1
Test of nail pulling-out resistance		50 × 100	3
Formaldehyde emission test		50 × 150	2 sets of the number of the test specimens such that the total surface area of the test specimens including the end-grains amounts to about 1 800 cm ² (the fractions of 5 and over shall be counted as a unit and the rest be disregarded).
Thermal insulation test		900 × 900	1
In-plane tensile strength test		50 × 50	1
Impact resistance test	Decorative hard board for interior finish	300 × 300	1
	Decorative hard board for exterior finish	300 × 300	1
Acid resistance test		100 × 100	1
Alkali resistance test		100 × 100	1
Stain resistance test		100 × 100	1
Discoloration resistance test		100 × 100	1 ⁽¹²⁾
Scratch resistance test		50 × 50	1
Film adhesion test		50 × 50	5

Table 23 (concluded)

Test item	Dimensions of test piece mm	Number of test pieces to be sampled from one board
Washability test	170 × 430	2
Weatherability test	70 × 150	3
Incombustibility test	220 × 220	1

Notes ⁽¹¹⁾ The span shall be 15 times the indicated thickness and be 150 mm or over.

⁽¹²⁾ Three test pieces shall be sampled for the patterned product.

6.2 Measurement of dimensions and squareness Measurement of the dimensions and squareness shall be as follows:

6.2.1 Thickness The thickness shall be measured by a measuring instrument with the accuracy of $\frac{1}{20}$ mm or finer at four points of 20 mm or over inside the periphery as indicated in Fig. 2, and shall be determined by the average value of four measurements. In this case, the part where the measuring instrument is brought into contact with the surface of the sample shall be the circle whose diameter is 6 mm or over. However, in the case where the unevenness is provided for the purpose of decoration, the measurement shall be made at the projecting part.

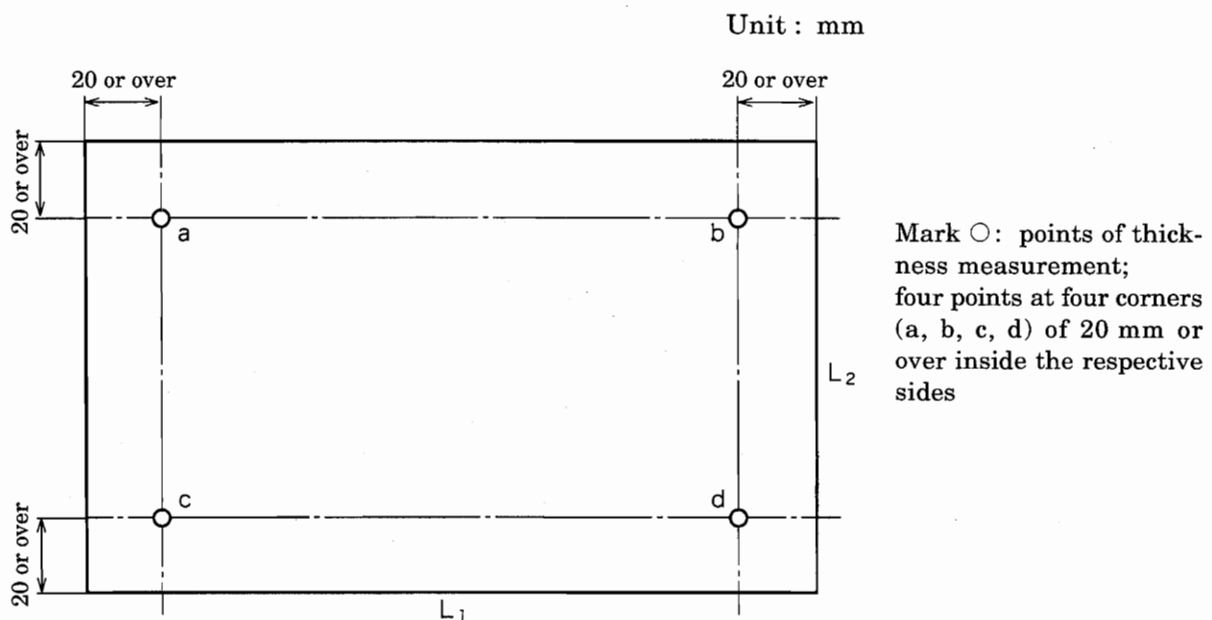


Fig. 2 Measurement of thickness

6.2.2 Width and length The width and length shall be measured by using a measuring instrument with the accuracy of 1 mm or finer. The measuring points of the width and length shall be about 100 mm inside the periphery and parallel to the respective sides as indicated in Fig. 3. Two measurements shall be made on each width and length. The average value of the two measurements is considered to be the width or length of the test piece.

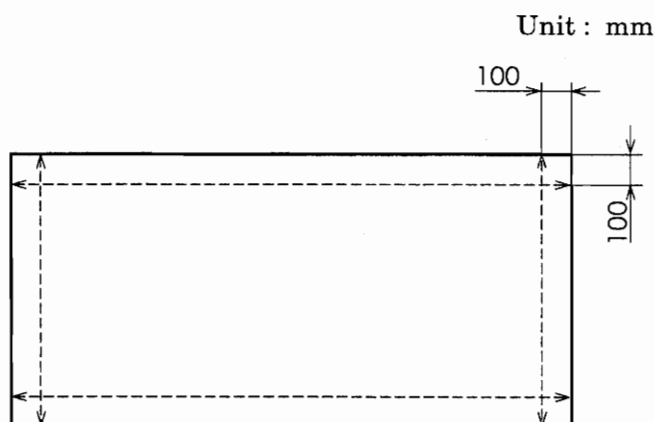


Fig. 3 Measuring points of width and length

6.2.3 Squareness Squareness shall be measured by setting the sample to the flat section square of grade 1, nominal size of 1 000 specified in **JIS B 7526** as indicated in Fig. 4, and the clearance (δ) created between the square and the sample at the point of 1 000 mm from the inner corner of the square with a measuring instrument with the accuracy of 0.5 mm or finer. Four corners of the sample shall be measured in this manner.

When the side length (l) of the sample is less than 1 000 mm, the clearance (δ) shall be measured at the end of the side length, and converted by the following formula:

$$\text{Converted clearance (mm)} = \frac{1\,000\delta}{l}$$

where, l : side length of the sample (mm)

δ : clearance (mm)

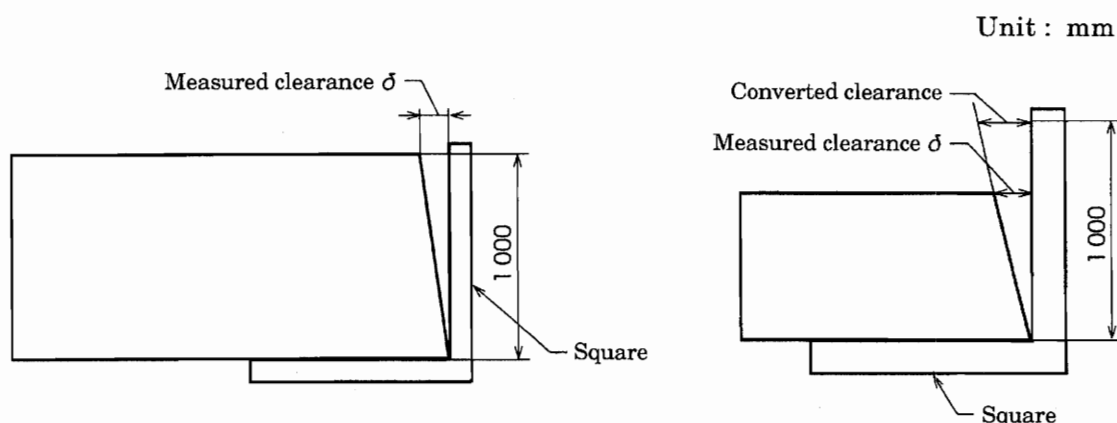


Fig. 4 Measurement of squareness

6.3 Density test In measuring the density, the width, the length and the thickness of measuring points as indicated in Fig. 5 shall be measured, the respective average values are considered to be the width, the length and the thickness of the test piece, and the volume (v) shall be obtained. Then, the mass (m_1) shall be measured, and the density shall be calculated by the following formula. In this case,

the thickness, the width, the length and the mass shall be measured to the nearest 0.05 mm, 0.1 mm, 0.1 mm and 0.1 g respectively, and the density shall be calculated to the nearest 0.01 g/cm³.

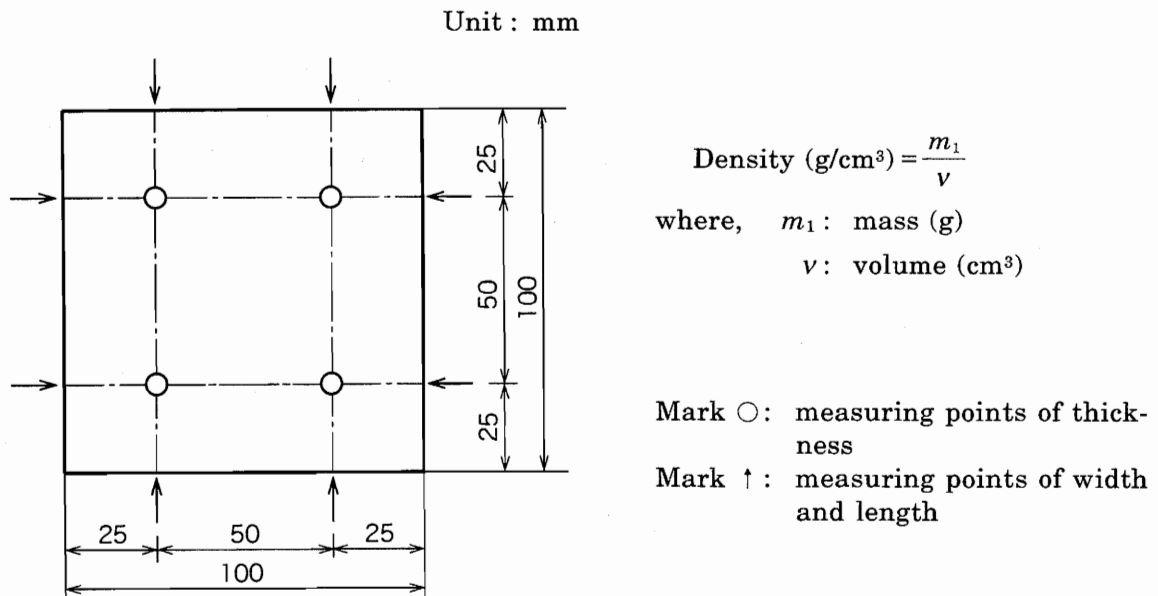


Fig. 5 Measuring points of width, length and thickness

6.4 Moisture content test The mass (m_1) of the test piece shall be measured, the test piece shall be put into an air drier which is kept at a temperature of 103 ± 2 °C, the mass (m_0) when the test piece reaches the constant weight shall be measured, and the moisture content shall be calculated by the following formula to one place of decimal:

$$\text{Moisture content (\%)} = \frac{m_1 - m_0}{m_0} \times 100$$

where, m_0 : mass after being dried (g)
 m_1 : mass before being dried (g)

6.5 Breaking load test The breaking load test shall be carried out on the test piece of No. 4 of **JIS A 1408**. The breaking load shall be the average of the values obtained in the tests for the longitudinal direction and for the transverse direction.

6.6 Bending strength test Using the test apparatus as shown in Fig. 6, apply a load of about 50 mm/min at a mean deforming rate on the surface of hard board test piece, or apply a load of about 10 mm/min on the surface of MDF or insulation board test piece. The maximum load (P) shall be measured, and the bending strength shall be obtained from the following formula:

The bending strength shall be the smaller value of the test results obtained in the longitudinal direction and in the transverse direction.

$$\text{Bending strength (N/mm}^2\text{)} = \frac{3PL}{2bt^2}$$

where, P : maximum load (N)
 L : span (mm)
 b : width of test piece (mm)
 t : thickness of test piece (mm)

Unit : mm

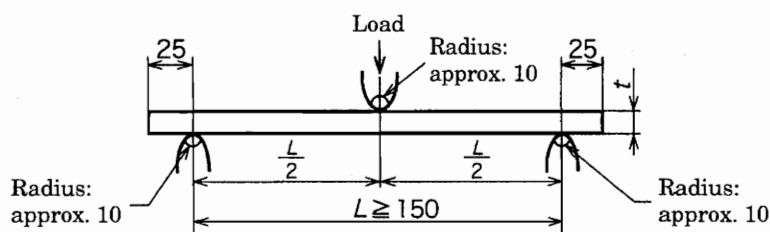


Fig. 6 Bending strength test apparatus

6.7 Bending strength test under wet conditions The bending strength test under wet conditions shall be specified as follows:

- a) **Bending strength test A under wet conditions** The test piece shall be immersed in hot water at a temperature of 70 ± 3 °C for 2 h, and immersed further in water at normal temperature for 1 h, and the bending strength test specified in 6.6 shall be carried out in the wet condition on the test piece, and the bending strength shall be obtained for each test piece. In calculating, the dimensions of the test piece before immersion in water shall be used.
- b) **Bending strength test B under wet conditions** The test piece shall be immersed in boiling water for 2 h, and further immersed in water at normal temperature for 1 h, and the bending strength test specified in 6.6 shall be carried out in the wet condition on the test piece, and the bending strength shall be obtained for each test piece. In calculating, the dimensions of the test piece before being immersed in water shall be used.

6.8 Water absorption test In the water absorption test, the mass of the test piece shall be measured before being dipped in water, and then, the test piece shall be placed vertically in water at a temperature of 20 ± 1 °C at the depth of about 2 cm below the water surface⁽¹³⁾, and taken out of water after being dipped for 24 h. Then, the test piece shall be held at the centre of ten sheets of blotting paper⁽¹⁴⁾ of 120 mm square in order to remove the excess water attached to the surface of the test piece, the planar weights of about 3 kg of the same size are loaded thereupon, take out the test piece after about 30 s, and the mass shall be measured within 10 min.

The water absorption shall be calculated for each test piece by the following formula:

Notes ⁽¹³⁾ The water where the test piece is immersed should preferably be of pH 6 ± 1 .

⁽¹⁴⁾ The blotting paper shall be of the quality of 200 g/m².

$$\text{Water absorption (\%)} = \frac{m_2 - m_1}{m_1} \times 100$$

where, m_1 : mass of the test piece before immersion (g)
 m_2 : mass of the test piece after immersion (g)

6.9 Test of swelling in thickness after immersion in water First the thickness of the centre part of the test piece shall be measured to the nearest 0.05 mm by a dial gauge or a micrometer, next the test piece shall be placed in water horizontally in depth of about 3 cm below the water surface at a temperature of 20 ± 1 °C. After immersion in water for 2 h in the case of the insulation board, or for 24 h in the case of the MDF, the test piece shall be taken out of water, the water on the test piece shall be removed, and the swelling in thickness after immersion in water shall be calculated by the following formula:

$$\text{Swelling in thickness after immersion in water (\%)} = \frac{t_2 - t_1}{t_1} \times 100$$

where, t_1 : thickness of the test piece before immersion (mm)
 t_2 : thickness of the test piece after immersion (mm)

6.10 Test of change in length after immersion in water In the test of the change in length after immersion in water, the bench marks shall be marked so that the gauge length between the bench marks of the test piece is about 160 mm as indicated in Fig. 7. The distance between the bench marks shall be measured by using a reading microscope with the accuracy of $\frac{1}{100}$ mm or finer, and the measured value shall be the base length (L_1). Then, after the test piece is immersed in water for 24 h according to the method as specified in 6.9, the test piece shall be taken out of water, and the water on the test piece is removed, and the length (L_2) between the bench marks shall be measured, or the whole length of the test piece shall be held by a measuring equipment made of steel provided with a dial gauge with the accuracy of $\frac{1}{100}$ mm or finer as indicated in Fig. 8, the distances L_1 and L_2 shall be measured, and the change in length after immersion in water shall be obtained by the following formula.

The change in length after immersion in water shall be the greater of the test results obtained in the longitudinal direction and in the transverse direction. The change in length after immersion in water for the decorative hard board for exterior finish shall be measured in the longitudinal direction⁽¹⁵⁾.

Note ⁽¹⁵⁾ The longitudinal direction means the direction of the longer side of the test piece.

$$\text{Change in length after immersion in water (\%)} = \frac{L_2 - L_1}{L_1} \times 100$$

where, L_1 : length before immersion (mm)
 L_2 : length after immersion (mm)

Remarks : It is preferable that milky glasses should be affixed with epoxy resin adhesive or the like beforehand, and the bench marks should be marked by using a line marking device as specified in **JIS A 1129**.

Unit : mm

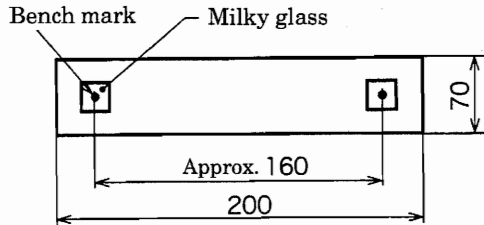


Fig. 7 Test piece for change in length after immersion in water

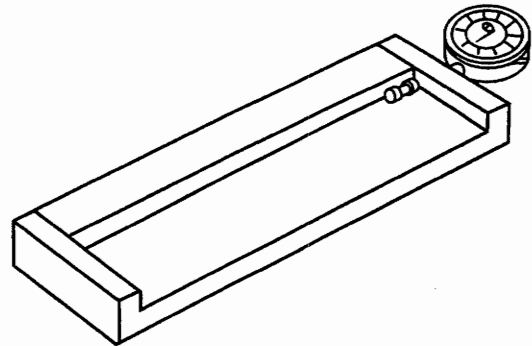


Fig. 8 Example of measuring device of change in length after immersion in water

6.11 Internal bond test The test piece shall be adhered to a steel or aluminum block as indicated in Fig. 9, the tensile load is applied vertically to the surface of the test piece, the maximum load (P') at the time of the fracture of the adhesion part shall be measured, and the internal bond shall be calculated by the following formula.

In this case, the tensile load speed shall be about 2 mm/min.

$$\text{Internal bond (N/mm}^2\text{)} = \frac{P'}{b \times L}$$

where, P' : maximum load at the time of the fracture of the adhesion part (N)

b : width of sample (mm)

L : length of sample (mm)

Unit : mm

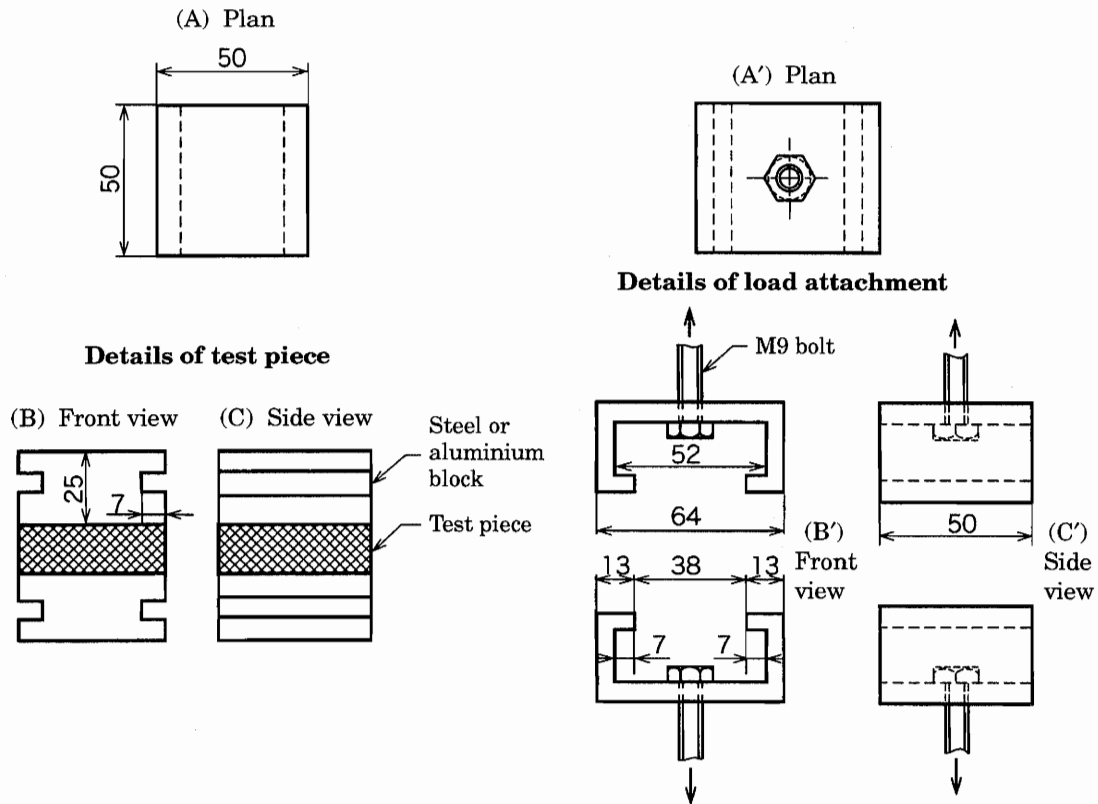


Fig. 9 Adhesion test apparatus

Information : The epoxy resin or the hot melt adhesive should preferably be used in adhering the test piece to the steel or aluminium block.

6.12 Test of wood screw holding power In the test of wood screw holding power, the threaded part (about 11 mm long) of a wood screw whose nominal diameter is 2.7 mm and length is 16 mm as specified in **JIS B 1112** shall be screwed vertically into the positions as indicated in Fig. 10⁽¹⁶⁾, the test piece shall be fixed, and the wood screw shall vertically be pulled out. The maximum load required therefor shall be measured respectively, and the wood screw holding power shall be determined by the average obtained from the measured values at two positions. The pulling-out load speed shall be about 2 mm/min.

Note ⁽¹⁶⁾ Guide holes of about 3 mm deep should be made by using a drill of 2 mm in diameter.

Unit : mm

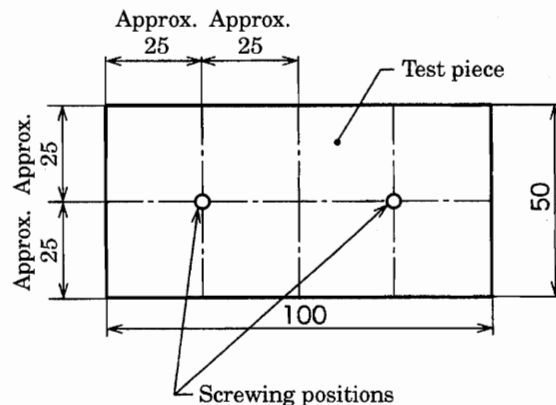


Fig. 10 Test piece for wood screw holding power

6.13 Test of nail pulling-out resistance In the test of the nail pulling-out resistance, the nail of N38⁽¹⁷⁾ as specified in **JIS A 5508** shall be driven vertically into the flat or the groove part along the axis of the test piece from the decorative surface side. The tip of the nail projecting from the rear surface shall be held, and pulled until the nail head is penetrated through the test piece, the maximum load shall be measured and the nail pulling-out resistance shall be determined by the average of three measured values. In this case, the pulling-out speed shall be about 2 mm/min.

Note (17) The nail of N38 as specified in **JIS A 5508** shall have the diameter of 2.15 mm, the length of 38 mm, and the diameter of the head of 5.1 mm as informative reference value. The diameter of the head of the nail to be used in the test shall be measured, and only uniform ones shall be used for the test.

6.14 Formaldehyde emission test The formaldehyde emission test shall be carried out on the three boards sampled according to **JIS A 1460**, and the mean value and the maximum value of them shall be regarded as the emission quantity. However, the measured values for two sets of test piece in one sheet of board shall be expressed by two places of significant figure, and the mean value shall be rounded-off to one place of decimal. The mean value of measured values for three boards shall be, also, rounded-off to one place of decimal.

The method to round-off numeral value shall be in accordance with **JIS Z 8401**.

6.15 Thermal insulation test In the thermal insulation test, the thermal resistance shall be obtained in accordance with **JIS A 1420** where the surface temperature is measured at the average temperature of 30 ± 3 °C in the direction of heat flow upward.

6.16 In-plane tensile strength test An attachment having an adhesive surface of 20 mm square or a circular adhesive surface of 400 mm² shall be adhered to the centre of the surface of the test piece by using an adhesive, and after the adhesive is solidified, notches reaching the basis board shall be made in the circumference of the attachment. Then, the test piece and the attachment shall be fixed as shown in

Fig. 11, and tension is applied at a load speed of about 2 mm per minute in the orthogonal direction to the adhered surface, and the maximum load (P') shall be measured when the separation occurs. The in-plane tensile strength shall be calculated by the following formula:

$$\text{In-plane tensile strength (N/mm}^2\text{)} = \frac{P'}{400}$$

where, P' : maximum load in the separative fracture (N)
400 : area of the adhered attachment (mm²)

Unit : mm

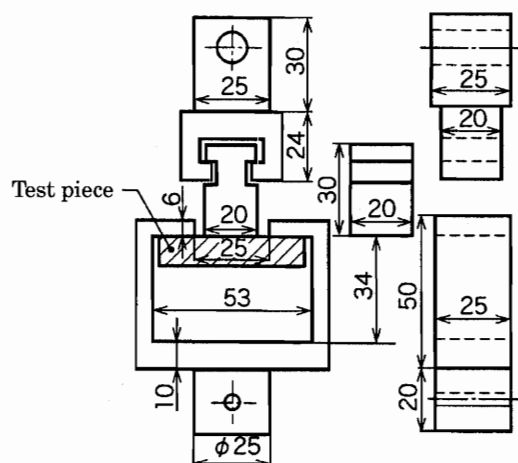


Fig. 11 Test piece and attachment for in-plane tensile strength

6.17 Impact resistance test In the impact resistance test for the decorative hard board for interior finish, the test piece shall be placed with the top surface upward supported by the whole surface on sand method as specified in S1 of 5.2 Table 3 of **JIS A 1408**, and a spherical weight made of steel as specified in Table 24 shall be dropped from the specified height onto the centre part of the surface, and cracks and fractures on the surface shall be visually observed, and at the same time, the diameter of the recess shall be measured. In the impact resistance test for the decorative hard board for exterior finish and decorative MDF, the test piece shall be fixed on the rigid supporting frame with four sides as shown in Fig. 12 with the decorative surface upward, and the egg-plant shaped weight (symbol W_1-1000) as shown in Fig. 13 is dropped from the height of 60 cm onto the centre part of the test piece, and the decorative surface shall be observed.

Table 24 Weight to be used in impact resistance test

Classification	Thickness of test piece mm	Weight to be used				Dropping height of weight cm
		Symbol	Mass g	Nominal size	Diameter mm	
Decorative hard board for interior finish	Under 5	W ₂ -300	Approx. 286	1 $\frac{5}{8}$	Approx. 41	50
	5 and over	W ₂ -500	Approx. 530	2	Approx. 51	50
Decorative hard board for exterior finish		W ₁ -1000	Approx. 1 000	—	52	60
Decorative MDF	Under 15	W ₂ -300	Approx. 286	1 $\frac{5}{8}$	Approx. 41	50
	15 and over	W ₂ -500	Approx. 530	2	Approx. 51	100

Unit : mm

Unit : mm

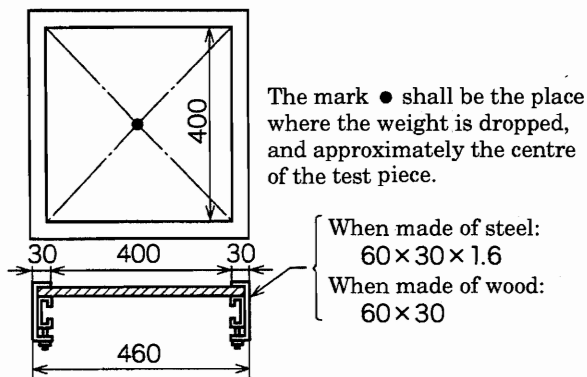


Fig. 12 Supporting frame for the impact resistance test of hard board for exterior finish

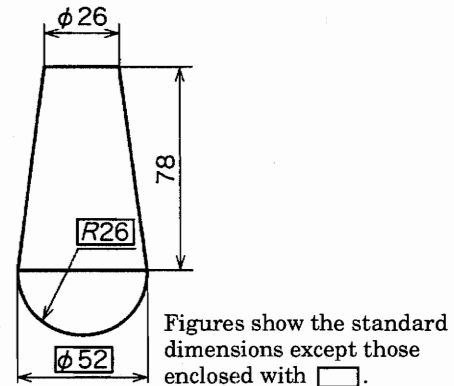


Fig. 13 Shape of weight

6.18 Acid resistance test In the acid resistance test, the test piece shall be placed horizontally, several drops of 5 % acetic acid solution⁽¹⁸⁾ shall be dropped onto the surface of the test piece, and the drops shall be covered with a watch glass. After 2 h, the watch glass shall be removed, and the test piece shall be immediately washed with water and left still in a room, and after 24 h, the surface condition shall be visually observed.

Note ⁽¹⁸⁾ 5 % acetic acid solution shall be prepared by using acetic acid as specified in **JIS K 8355** or acetic anhydride as specified in **JIS K 8886**.

6.19 Alkali resistance test In the alkali resistance test, the test piece shall be placed horizontally, several drops of 1 % sodium carbonate solution⁽¹⁹⁾ shall be dropped onto the surface of the test piece, and the drops shall be covered with a watch glass. After 2 h, the watch glass shall be removed, and the test piece shall be immediately washed with water and left still in a room, and after 24 h, the surface condition shall be visually observed.

Note ⁽¹⁹⁾ 1 % sodium carbonate solution shall be prepared by using sodium carbonate (10 hydrate) as specified in **JIS K 8624** or sodium carbonate as specified in **JIS K 8625**.

6.20 Stain resistance test In the stain resistance test, the test piece shall be fixed horizontally, a plate having a punched hole part of 2 cm × 4 cm shall be placed on the surface, the decorative surface shall be smeared until it becomes totally covered with the crayon (red) as specified in **JIS S 6026**. After it is left as it is for 2 h, the smeared crayon shall be wiped off by a cloth or a nylon brush soaked with petroleum benzene as specified in **JIS K 8594** so as not to damage the decorative layer, and the surface shall be observed by using the grey scale as specified in **JIS L 0805**.

6.21 Discoloration resistance test In the discoloration resistance test, a testing machine as specified in 3.1 (1) of **JIS K 7102** shall be used, and after irradiation for 48 h in accordance with the B-1 method as specified in clause 2 (2.1) of **JIS K 7102**, cracks, swelling or the like on the surface of the test piece shall be observed. Then, the test piece shall be left still in a dark place of a relatively dry room.

The test piece to be used for reference shall previously be left still in the same place without irradiation.

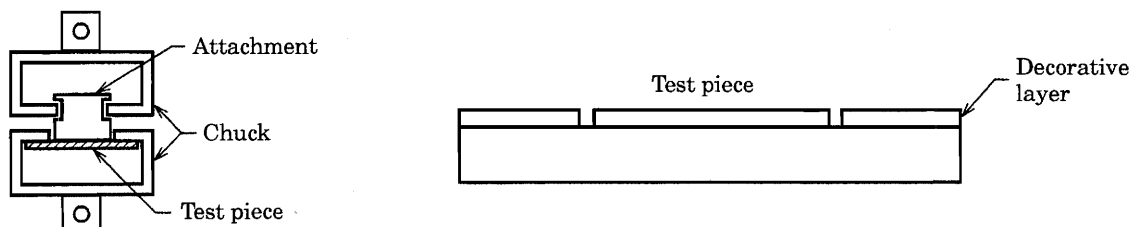
The test piece shall be taken out of the dark place after 2 h of irradiation, discoloration shall be measured by using the grey scale as specified in **JIS L 0804**, or measured based on the method of specification $L^*a^*b^*$ colour system as specified in **JIS Z 8730** by using a colorimeter as specified in **JIS K 7102**. For the test piece with grain or other pattern, however, discoloration shall be judged by the average of three colour difference values.

Remarks : When an enclosed carbon-arc type light- and water-exposure apparatus or an open-flame sunshine carbon-arc type light and water-exposure apparatus is used, comparative data after irradiation for 48 h by an enclosed carbon-arc type light-exposure apparatus shall be verified.

6.22 Scratch resistance test In the scratch resistance test, a scratch tester of Martens type with 3 mm ball diameter shall be used, the load of the scratch tester shall be 4.9 N, and the test piece shall be slid in the longitudinal and transverse directions by about 30 mm with the upper surface of the test piece upward. This sliding shall be carried out on three places both in the longitudinal and transverse directions, and the test piece shall be visually observed at the position of about 60 cm away from the test piece.

6.23 Film adhesion test In the film adhesion test, an attachment having an adhesive surface of 20 mm square as shown in Fig. 14 shall be adhered to the centre of the decorative surface of test piece by using an adhesive. After the adhesive is solidified, notches shall be made along the circumference of the attachment until the notches reach the basis material of the decorative surface. A chuck shall be fixed as indicated in Fig. 14, and tension shall be applied at a load speed of about 2 mm/min in the direction orthogonal to the adhesive surface, and the fractured surface shall be observed. The result shall be expressed by the lowest one of five test results.

Information : As for the adhesive, two-part and non-solvent epoxy resin adhesive with high viscosity (as for epoxy resin, epoxy equivalent 170 to 250, and as for hardener, a modified polyamide resin with amine value 200 to 300), or cyano-acrylate adhesive is preferable.



Information : The attachment shall be made of steel or may be made of other materials, taking into consideration of the disposability.

Fig. 14 Test piece for the film adhesion test and its attachment

6.24 Washability test In the washability test, the test piece whose decorative surface being faced upward, shall be fixed horizontally on the test table of the washability tester⁽²⁰⁾ as indicated in Fig. 15. Then, the pre-treated⁽²¹⁾ brush⁽²²⁾ shall be put on the decorative surface to rub the decorative surface applying pressure of 4.41 N to the brush. In this operation, the surface to be rubbed shall be constantly kept wet with soapy water⁽²³⁾, and after the brush is reciprocated 500 times, the test piece shall be removed from the tester and washed with water, and the centre part of 100 mm length of the trace rubbed by the brush shall be examined under the diffused daylight. The result shall be expressed by the lower one of two test results.

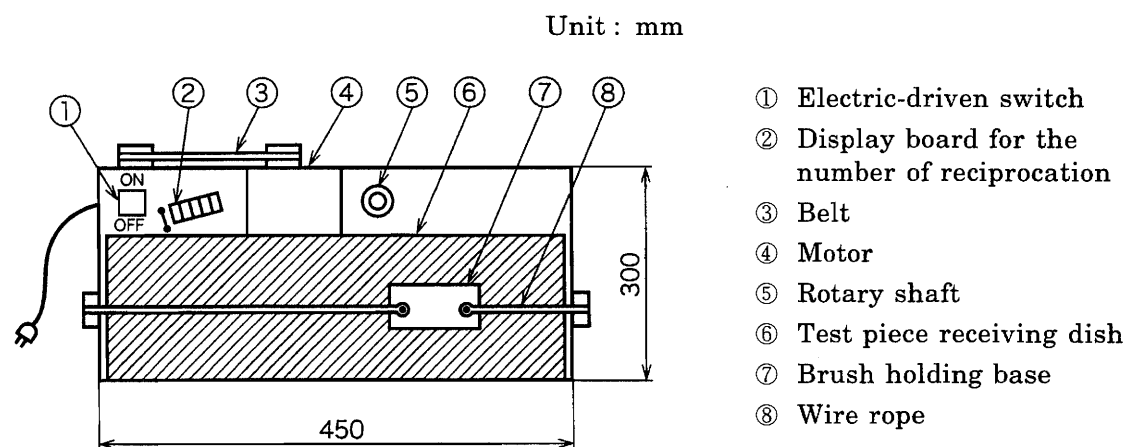


Fig. 15 Washability test machine

Notes (20) The washability testing machine shall be made so that the brush reciprocates on the test piece as indicated in Fig. 15. The brush shall be reciprocated in the distance of about 300 mm at the rate of about 37 reciprocations per minute at approximately equal speed between the space of about 100 mm in the centre. As a washability testing machine, the Gardner straight type washability machine or the like may be suitable.

- (21) The hair tip of the brush shall be immersed to the depth of 12 mm in water whose temperature is about 20 °C for about 30 min, water shall be removed by shaking the brush strongly, and the brush shall be used after immersed in soapy water and infiltrated with the liquid sufficiently.
- (22) 60 holes of 3 mm in diameter shall be uniformly bored in the base of the brush 90 mm × 38 mm in size, bristles of black pigs shall be planted uniformly in each hole, and the hairs shall be neatly cut to be flat in the direction orthogonal to the tip of hairs to become about 19 mm in length. The base shall be made of fine-grained and hard wood of about 25 mm in thickness or made of aluminium of about 13 mm in thickness.
- (23) 0.5 % solution without additive (type 1) as specified in **JIS K 3302**.

6.25 Weatherability test In the weatherability test, the test piece shall be inserted in a sample holder in accordance with the method of **JIS A 1415**, and mounted on test apparatus for accelerated artificial exposure, and the irradiation shall be started. When the total irradiation time reaches 500 h for WV type or 250 h for WS type, the test specimen shall be taken out and observed after standing for 1 h, and the surface condition shall be compared with the non-exposed one⁽²⁴⁾. The result shall be expressed by the lowest one of the three test results.

Note ⁽²⁴⁾ The no-exposed decorative board shall be stored in the room keeping out of direct sunshine.

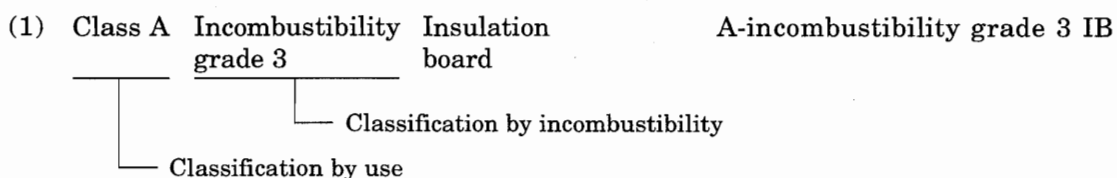
6.26 Incombustibility test The incombustibility test shall be in accordance with **JIS A 1321**.

7 Inspection The inspection shall be as follows:

- a) The shape, dimensions, appearance and quality shall be inspected by a reasonable inspection method.
- b) The formaldehyde emission quantity, heat insulation, acid resistance, alkali resistance, stain resistance, discoloration resistance, scratch resistance, film adhesion, washability, weatherability and incombustibility shall be inspected under type inspection when the product is newly designed or modified, or when the conditions of production are changed.

8 Designation The fibreboard shall be designated as shown in the following examples. However, the classifications according to the surface conditions of face and back and according to the smoothness, and ordinary grade classified according to the incombustibility and the like may be omitted if they are not necessarily to be indicated.

Example 1 Insulation board



- | | |
|---------------------------------------|------|
| (2) Class A Ordinary Insulation board | A-IB |
| (3) Straw-mat (TATAMI) board | T-IB |
| (4) Sheathing board | S-IB |

Example 2 MDF

- (5) Basis board polished 25 U F☆☆☆☆ Ordinary MDF RS-25UF☆☆☆☆ MDF
or 25UF☆☆☆☆ MDF
- Classification according to the incombustibility
- Symbol of classification according to the formaldehyde emission quantity
- Classification according to the adhesive
- Classification according to the bending strength
- Classification according to the surface condition
- (6) Basis board polished 30 M F☆☆☆ Incombustibility grade 2 MDF
RS-30MF☆☆☆Incombustibility grade 2MDF
- (7) Basis board polished 15 U F☆☆ MDF RS-15UF☆☆MDF
- (8) Plastics overlay 30 U F☆☆☆☆ Ordinary MDF DO-30UF☆☆☆☆ MDF

Example 3 Hard board

- (9) Basis board unpolished Smooth on one surface Standard Type 35 Ordinary hard board
RN · S1S S35-HB
- Classification according to the incombustibility
- Classification according to the bending strength
- Classification according to the special treatment by oil, resin or the like
- Classification according to the smoothness
- Classification according to the surface condition
- (10) Basis board polished S2S Type T45 Ordinary Hard board
RS · S2S T45-HB
- (11) Basis board unpolished S1S Type T35 Incombustibility grade 3 Hard board
T35-incombustibility grade 3 HB
- (12) Decorative board for interior finish S1S Type S35 Incombustibility grade 2
Hard board
DI · S35-incombustibility grade 2 HB
- (13) Decorative board for exterior finish S2S Type T45 Hard board
DE · T45-HB

9 Marking The following items shall be marked on the product or on the packing. Marking may be made for each package.

Moreover, for the MDF products for sheathing (floor, inside wall, outside wall, roof), the items of the kind (or symbol) of classification according to formaldehyde emission quantity, **c**) and **d**) shall be marked for each product.

- a) Classification or symbol
- b) Dimensions (thickness \times width \times length)
- c) Year and month of manufacture or their abbreviation
- d) Name of manufacturer or its abbreviation
- e) Cautions

Example : Care shall be enough taken of storage because of being in danger of absorbing formaldehyde emitted from other products.

Attached Table 1 Normative references

- JIS A 1321 *Testing method for incombustibility of internal finish material and procedure of buildings*
- JIS A 1408 *Test methods of bending and impact for building boards*
- JIS A 1415 *Methods of exposure to laboratory light sources for polymeric material of buildings*
- JIS A 1420 *Determination of steady-state thermal transmission properties—Hot box method*
- JIS A 1460 *Building boards determination of formaldehyde emission—Desiccator method*
- JIS A 5508 *Nails*
- JIS B 1112 *Cross-recessed head wood screws*
- JIS B 7526 *Squares*
- JIS K 3302 *Laundry bar soaps*
- JIS K 7102 *Testing method for colour fastness of plastics upon exposure to light of the carbon arc*
- JIS K 8001 *General rule for test methods of reagents*
- JIS K 8355 *Acetic acid*
- JIS K 8594 *Petroleum benzine*
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